DIN 18035-7 Synthetic Turf Areas - still up-to-date?

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DIN 18035 part 7 has received little international recognition since there is no translation into English available. The DIN is of high importance for the German market since public projects require test reports according to this standard.

After all we heard and experienced yesterday, it seems to be obsolete to talk about the DIN at all. However, since the DIN has still importance in the German market-place, it is necessary that somebody who is rather knowledgable in this field explains its good and its outdated aspects. Fortunately, there are still public authorities using their common sense when reviewing the documentation of sports surface products so that a discussion is reasonable.

The first version of the DIN was published in February 1993 (still officially valid). It was based on the results of a research project performed by SKZ. A **new version** was published in August of this year. However, even members of the DIN committee do not have a copy and do not even know about this publication. Thus, I will refer to the **ready-for-print version** of which I have got a copy. The publication of a new edition of the DIN is remarkable since this violates the European standstill agreement which states-: no further development of national standards when an appropriate European standard is in preparation. In this case, they did not even refer to already existing European standards within the new DIN 18035-7.

The new version has been published as a **draft** the use of it is normally not obligatory. Not so with DIN: the new standard was given the name ‚draft' only. However, in reality it is treated as the only valid version (supported by the DIN committee, RAL and FMPA). The consequence is that job specifications will include testing according to the new DIN as a mandatory request. So companies need new test reports now. According to DIN, it is also permitted that test houses issue test reports with respect to standards which are still under negotiations and known to DIN committee members only.

Let us have a look at the content of the DIN. I will try to emphasize where and in which way the new DIN differs from the old one.

The standard covers Synthetic Turf Areas outdoors with and without in-filled pile-layer. The DIN distinguishes between the **total construction** of a turf pitch including the subconstruction and the **turf surfacing**. The DIN also use a third term: **Total System** (Gesamtsystem) which refers to the turf layer + its **elastic** underlayments. The idea is (I am not saying: the trick) that a synthetic turf cannot be tested without a certain elastic underlayment and only in a certain combination of them. This idea was especially supported because it helps the installers against the turf manufacturers since the manufacturers do not produce elastic underlayments but need the cooperation of the installers for this.

The DIN is outlined as follows:

Scope
Normative References
Terms
Requirements
Testing
Test Procedures
Use and Maintenance

TERMS

New is now that the **Elastic Supporting Layer** and the **Elastic Layer** are assigned to provide the give of the Synthetic Turf construction. This has been introduced in order to find an easy reason to make such layers mandatory and to exclude rubber-filled turf – at least to make sure that rubber-filled turf must always be installed with an additional elastic underlayment.

A completely new addition is the term **Environmental Compatibility** (Umweltverträglichkeit UVP). It refers to characteristics of the individual layers of a turf construction as they affect the soil of the underground, the ground water and/or the air when they are used.

REQUIREMENTS

This is then the first item of the next paragraph REQUIREMENTS.

Originally, the concept of Environmental Compatibility was developed for synthetic surfacings of athletic tracks etc. The idea was and is to control the most dangerous substances which might leak from the surfacing or any of its underlayments. This avoids publishing recipes of the products which are considered confidential and propriatery. In principle, samples of the various layers are subjected to a leaching process and the leached substances are determined as:

Parameter	Guiding Limit	Unit
DOC (diluted organic carbon)	<= 20 / <= 40	mg/l
EOX (extractable organic halogens)	<= 100	mg/kg
Lead (Pb)	<= 0.04	mg/l
Cadmium (Cd)	<= 0.005	mg/l
Chromium total (Cr)	<= 0.05 / <= 0.008 <= 50	mg/l mg/kg
Chromium VI (Cr VI) *)	<= 0.008	mg/l
Mercury (Hg)	<= 0.001	mg/l
Zinc (Zn)	<= 2.0	mg/l
Tin (Sn)	<= 0.05	mg/l
Toxicitiy	> 50	%
Smell	to be described	
Physical Condition	to be described	

*) not to be determined when turf certainly does not contain lead chromate

As you can see, the parameters were selected for synthetic surfacings. The DIN has set **Guiding Limits** (Richtwerte) for the various parameters. It is notable that – although Guiding Limits are not requirements by definition – the*y* are treated as mandatory in many cases. The requirements were set empirically on the basis of numerous leaching tests with synthetic surfacings. Even reference to LAWA cannot hide the fact that – from a technical point of view – these values are of **orienting nature** only and do not have legal power. There is no evidence why these values apply to synthetic turf also. Simply, there was nothing else available. Thus, they were taken by lack of any alternate. This might be acceptable if the results are assessed with a sense of reality.

For instance: **Zinc** is a reasonable constituent of rubber products. Thus, whenever rubber granules are analysed you will find Zinc contents of high amounts. The leaching results with far more than 2.0 mg/l. The question is now what the consequences will be. Is it reasonable to simply discard rubber? We know from a study of publications of the World Health Organisation (WHO) that Zinc essentially has an organoleptic effect (affecting taste of water) only.

The other parameter which sometimes causes problems is **DOC** = Diluted Organic Carbon. DOC may be caused by sugar and this is – in a sports surface – certainly not harmfull. DOC is therefore only a comfortable indicator whether there is a certain amount of organic carbon. When the guiding limit is

crossed, the reason for the high DOC content must be answered. In the case of synthetic turf, the reason is often avivage. These substances are normally only temporary since they are washed off within a short time and the avivage substance is biologically absorbed.

The UVP concept helped a lot to eliminate the dangerous heavy metals Lead, Cadmium and Mercury from the market.

Fortunately, the leaching procedure has been adjusted to international standards (i.e. EPA) by not using the so-called **Percolation** test any longer.

There is a tiny line in the DIN saying: It is mandatory that these requirements have to be guaranteed by a quality monitoring program.

The new DIN has also introduced a list of parameters characterizing the individual components of a synthetic turf system such as:

- Synthetic Turf Layer
- Elastic Supporting Layer
- Elastic Layer (in-situ)
- Elastic Layer (prefabricated/attached to turf layer)

The parameters selected are:

- Extraction
- IR Scan
- NCO Content
- Content of Non-Volatiles
- Ash content

Further, the new DIN has introduced a list of descriptive parameters which are:

- Type Name
- Type of Material
- Type of Fibre / Monofilament
- Pile Layer Weight above Ground
- Length of Pile Fibres/Tufts above Ground
- Tufts per m2
- Thickness of Pile Fibres/Monofilaments
- Perforation of Back (grid distance + size of holes)
- Density
- Viscosity
- Sieve Analysis
- Strength (Tensile Strength, Elongation at Break, Modulus of Elasticity)

These parameters must be determined in a suitability test.

We will skip **Bound** and **Unbound Supporting Layers**. The most relevant change is that the new DIN covers water-permeable systems only.

Bound Elastic Supporting Layers

The new DIN specifies the **thickness** and its tolerances in more detail.

It is very important that the **strength** has been specified: min. 0.08 N/mm2. It is a permanent problem in site controls that the strength of such surfaces is much too low. Unfortunately, there is no way to fix such problems when they occur.

The requirement of **water permeability** has been reduced to min. 0.002 cm/s whereas the old requirement was min. 0.05 cm/s (= factor 20). This reflects the experience that an overly quick drainage is adverse since the turf dry*s* too fast, especially non-filled turf systems which need to be wet for acceptable playability.

Elastic Layers

The new DIN has introduced a requirement for **strength**: min. 0.1 N/mm^2. This requirement is certainly too low. A requirement of min. 0.2 N/mm^2 can easily be met when the installation is correctly performed.

Synthetic Turf Layers

There are major changes in this paragraph.

First of all, the **Modified Standard Deformation** has completely been eliminated. This issue certainly needed revision. However, I do not understand why this was decided so radically. The argument that there was never a requirement for this parameter does not hold. The mStD values were a good indicator of how a surface behaves under normal and adverse weather conditions – especially frost.

The description of the **Force Reduction** test procedure contains major errors. Although it was known from the discussions within the DIN Sub-committee and ISSS meeting in Le Mans that a filter roll-off condition of 2 poles is technically wrong, the DIN continues with the wrong stuff. However, Knauf/FMPA will never understand the basics of metrology.

The **water-permeability** of non-filled synthetic turf has been reduced to min. 0.0004 cm/s which was 0.002 cm/s before (factor = 5).

All the rest has remained in essence unchanged including **Ageing**. This is not acceptable when considering the test in detail. The test takes nearly half a year of exposure in a Xenon test apparatus. Then the top 5 mm of the pile are cut off and used for determination of the Melt Flow Index (PP fibres) or Viscosity Number (Polyamid fibres).

Although it is true that polymeric ageing processes change these indices, the real degree of ageing cannot be determined with them since the uncertainty of these determinations is unknown and certainly large. Finally, taking into account requirements such as ‚Increase of MFI < 100%' or ‚Decrease of VN < 50%' means nothing else but ‚each product meets'. Since this test procedure does not have any selective effect (distinction between usable and non-usable products), the only effect is to keep the test labs busy – and to enormously prolong testing time. This is exactly the intention of the RAL-FMPA group in order to slow down competitors when entering the German market with new products.

Finally, I am addressing the decision of the DIN committee that the new type of synthetic turfs is not covered by the DIN. In the view of many experts, this decision is arbitrary and based on word-splitting. From the history of this decision, it is clear that Russland/Polytan in cooperation with Knauf/FMPA were behind the scene. The argument is that synthetic turf according to DIN 18035-7 requires an elastic underlayment in any case – irrespective of the fact whether the turf layer with its rubber in-fill provides enough give or not. However, it is another question whether it is advisable to skip the elastic underlayment. This aspect could have been covered by a recommendation explaining the issue to the user of the standard also. But what was it all about? At the time of the decision the named company as a predominant member of the DIN committee wanted to win a project bid with a sand-filled turf product against a rubber-filled turf product.

Aside of the nomenclature problem, FMPA brought up **concerns about the environmental compatibility** of rubber in-fills. They are saying : no experience, dangerous etc. However, this position is inconsistent compared with the UVP concept included in the new DIN. If the rubber granules meet the UVP test what shall be questionable then? They question their own concept. In the meantime, there is a study of the RAL expert reviewing additional parameters regarding environmental effects. His results reveal no reasonable concerns even under extended investigation.

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